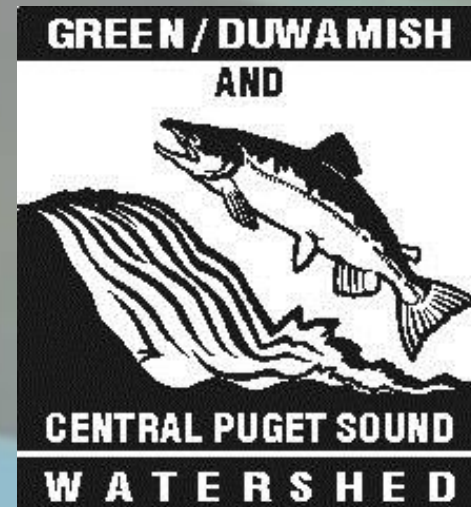


(Watershed Resource Inventory Area)

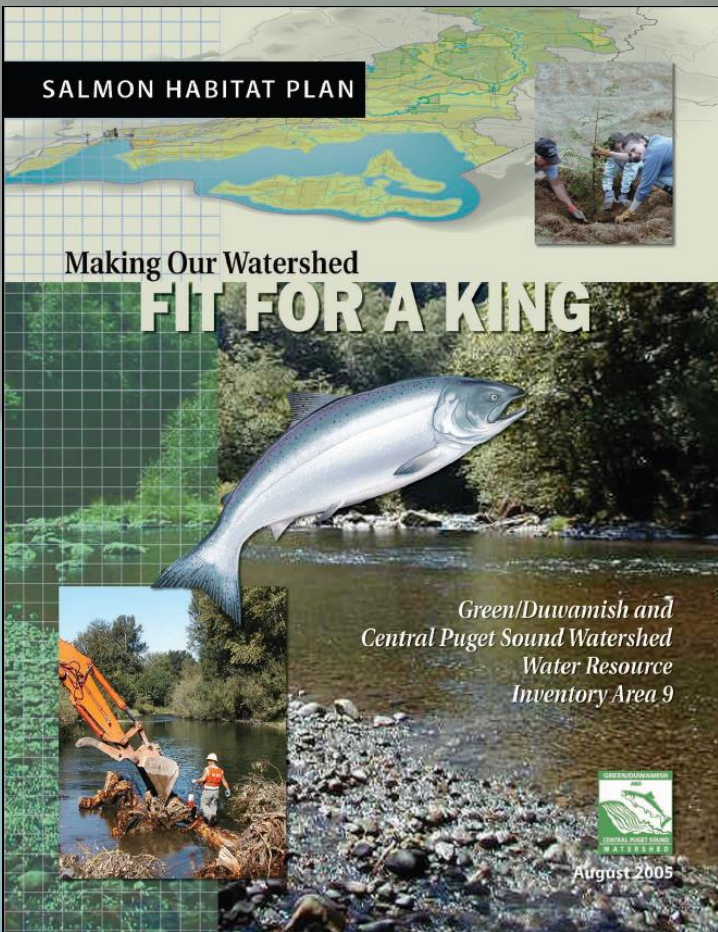
The WRIA 9 Marine Shoreline Monitoring and Compliance Pilot Project



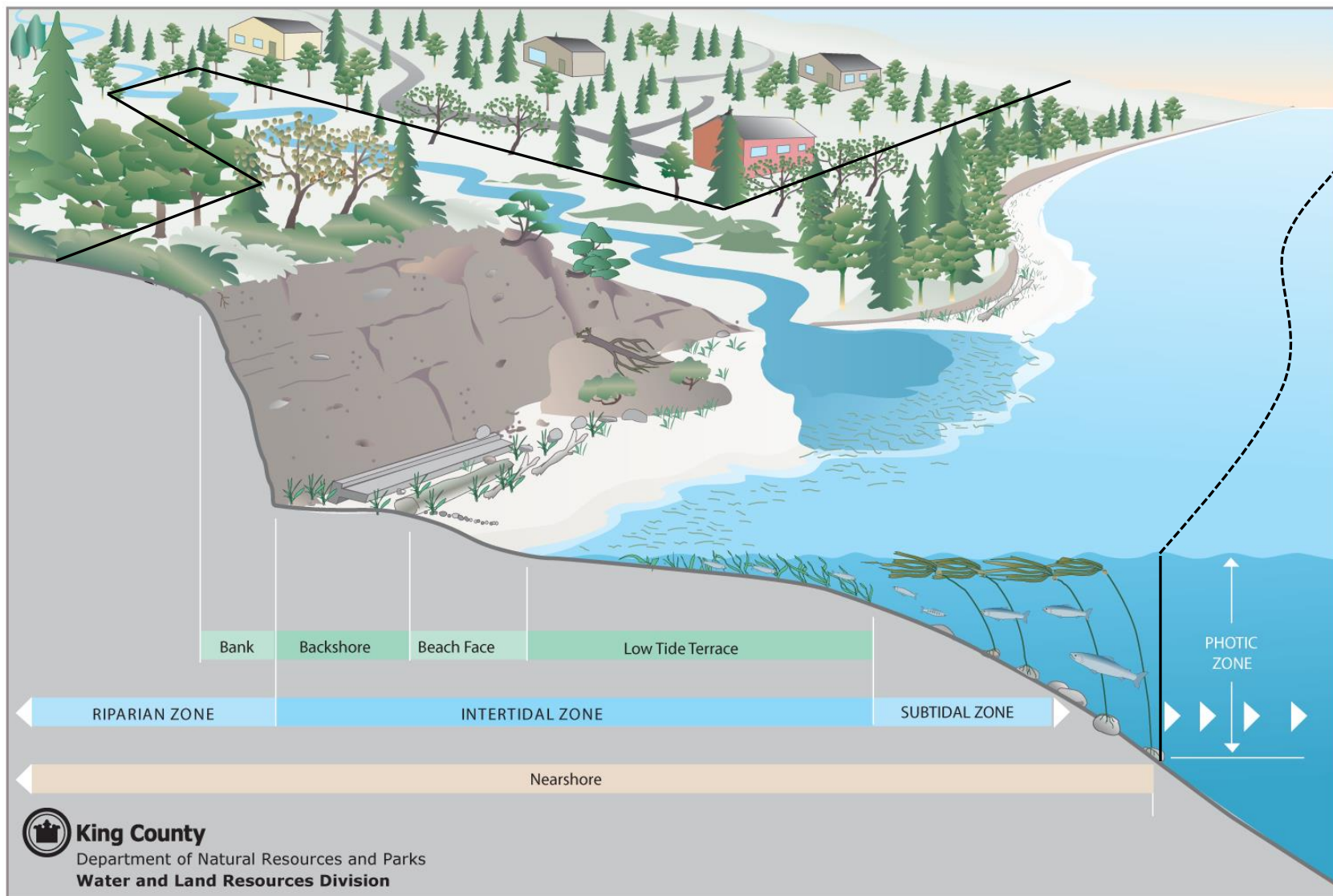
"This project received funding from the EPA under an agreement with WDFW. The contents do not necessarily reflect the views and policies of the EPA. Mention of trade names or commercial products does not reflect endorsement".

Why do this Project?

- WRIA 9 Salmon Plan calls for:
 - No new shoreline armoring
 - Monitoring of shoreline condition
 - “Improve enforcement of existing land use and other regulations”
- WRIA 9—2010 Status and Trends monitoring report called for boat based surveys vs. aerial photo analysis



Puget Sound Nearshore Ecosystems



Puget Sound Nearshore Ecosystems

Critical zone of transition

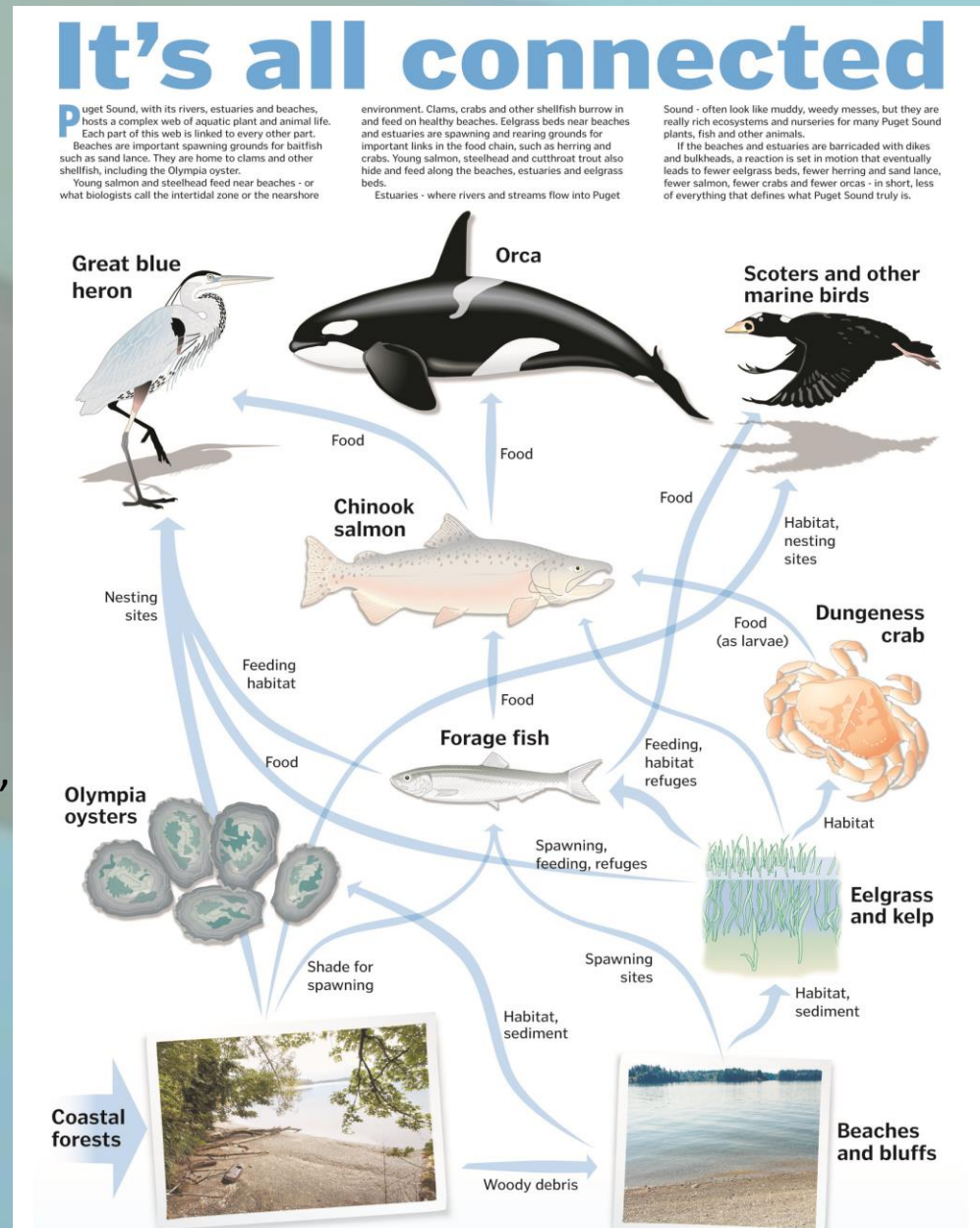
- marine, freshwater, and terrestrial ecosystems

Created and sustained by physical processes

- tidal exchange, wave-driven bluff erosion, and long-shore sediment transport

Supports complex mosaic of habitats and associated biota

- high productivity, complex food webs, large numbers of plants and animals





Typically made of: Rock or Rip-Rap, Cement,
Sheet Pile, Creosote Logs, broken concrete,
“ecology blocks”

Less typical—old tires, box springs, car bodies

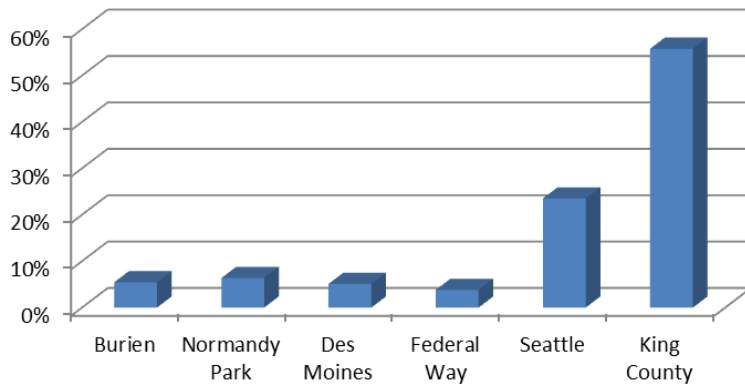
Impacts of Shoreline Armoring

- **Loss of woody debris**
- **Impounds sediments**
- **Interrupts littoral drift**
- **Beach erosion**
- **Loss or change in submerged aquatic vegetation**
- **Change in sediments sizes**
- **Change in invertebrate species composition**
- **Loss of riparian vegetation**
- **Reduces shallow water habitat**
- **Loss of forage fish spawning habitat**

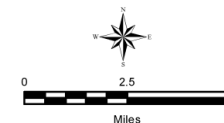
Project Area

- 92 miles
 - 52 miles rural (48% armored)
 - 40 miles urban (83% armored)

% of WRIA 9 shoreline



WRIA 9 Marine Shoreline Monitoring and Compliance Project





Characterized changes by boat

Type of change

- Shoreline armoring
- Docks/overwater structures
- Groins
- Clearing/grading
- Structures (houses/sheds/stairs)
- Aquaculture operations
- Other changes

Status

- New
- Major Repair
- Minor Repair

Material

- Wood
- Rock
- Concrete

In the office

QA/QC & verification of changes
by comparing to other photos

Vertical Aerial photos

2005
2007
2009 (2 sets)
2010
2012

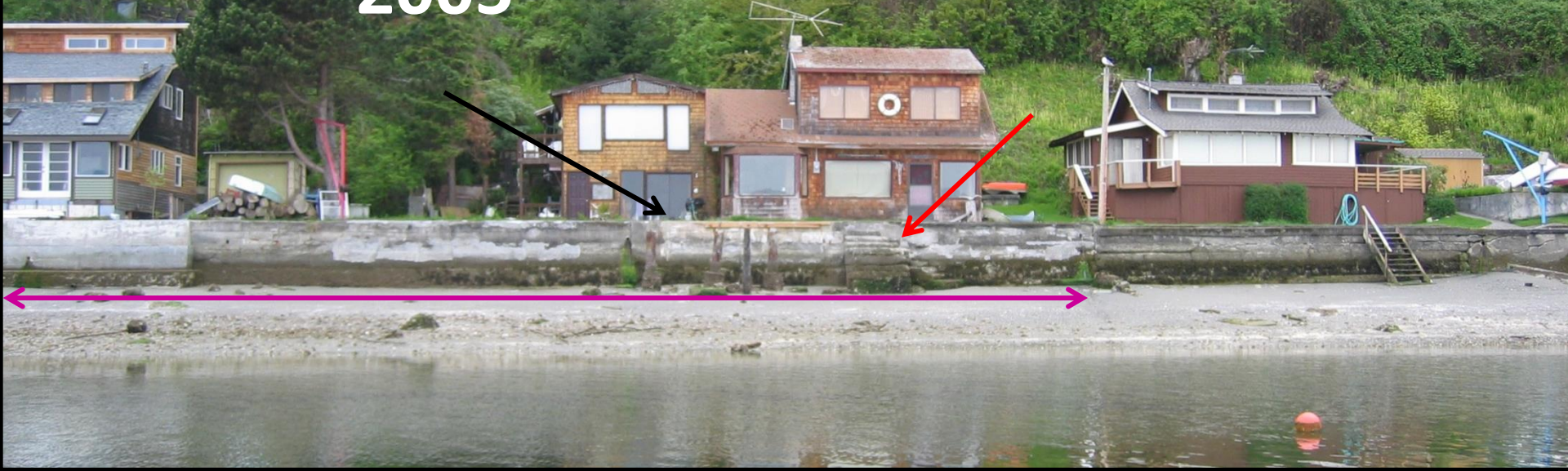
Oblique photos

2001 }
2006 } DOE
2011 King County

Field photos

2004
2006
2011 (Vashon only)

2005



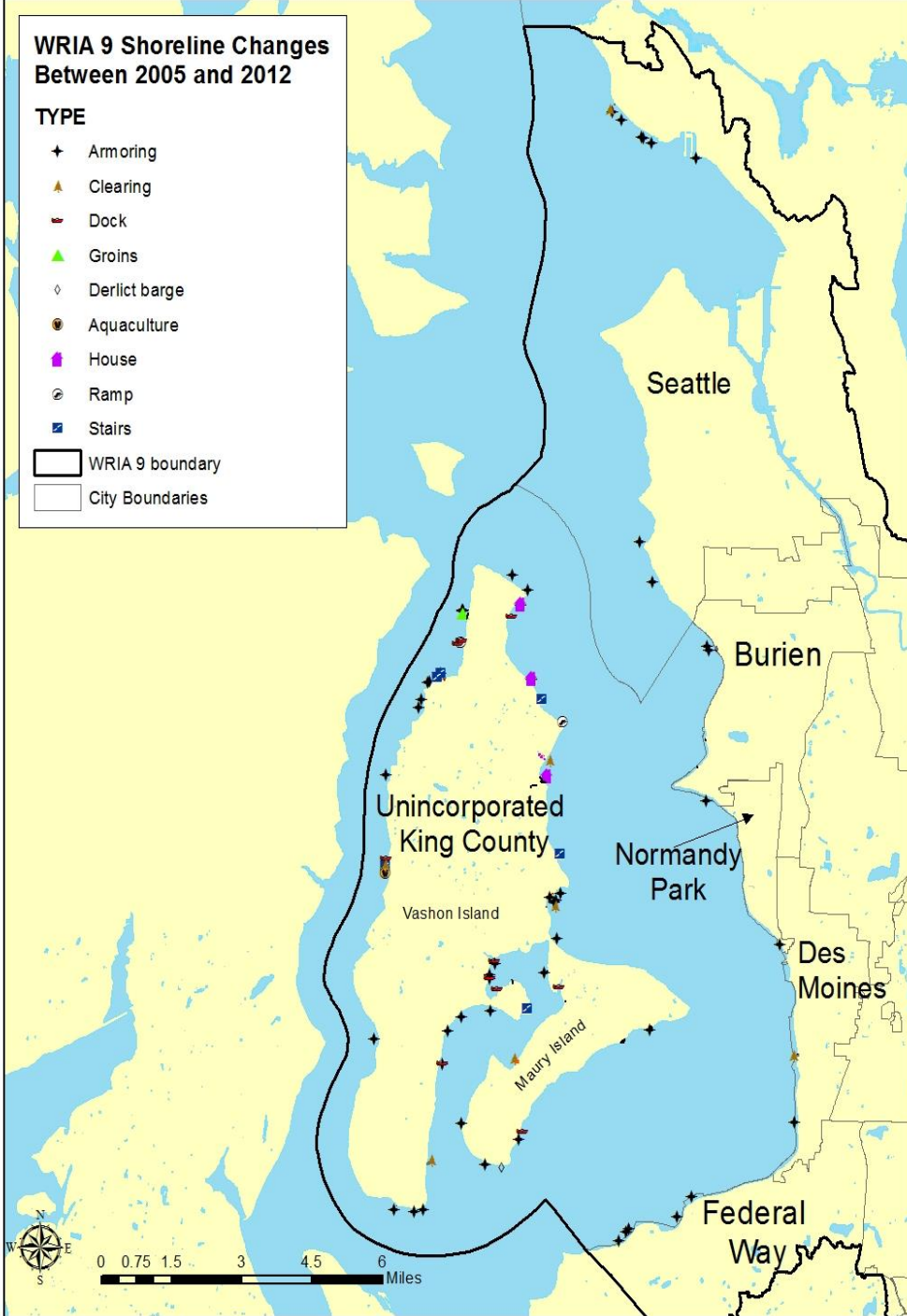
2012



WRIA 9 Shoreline Changes Between 2005 and 2012

TYPE

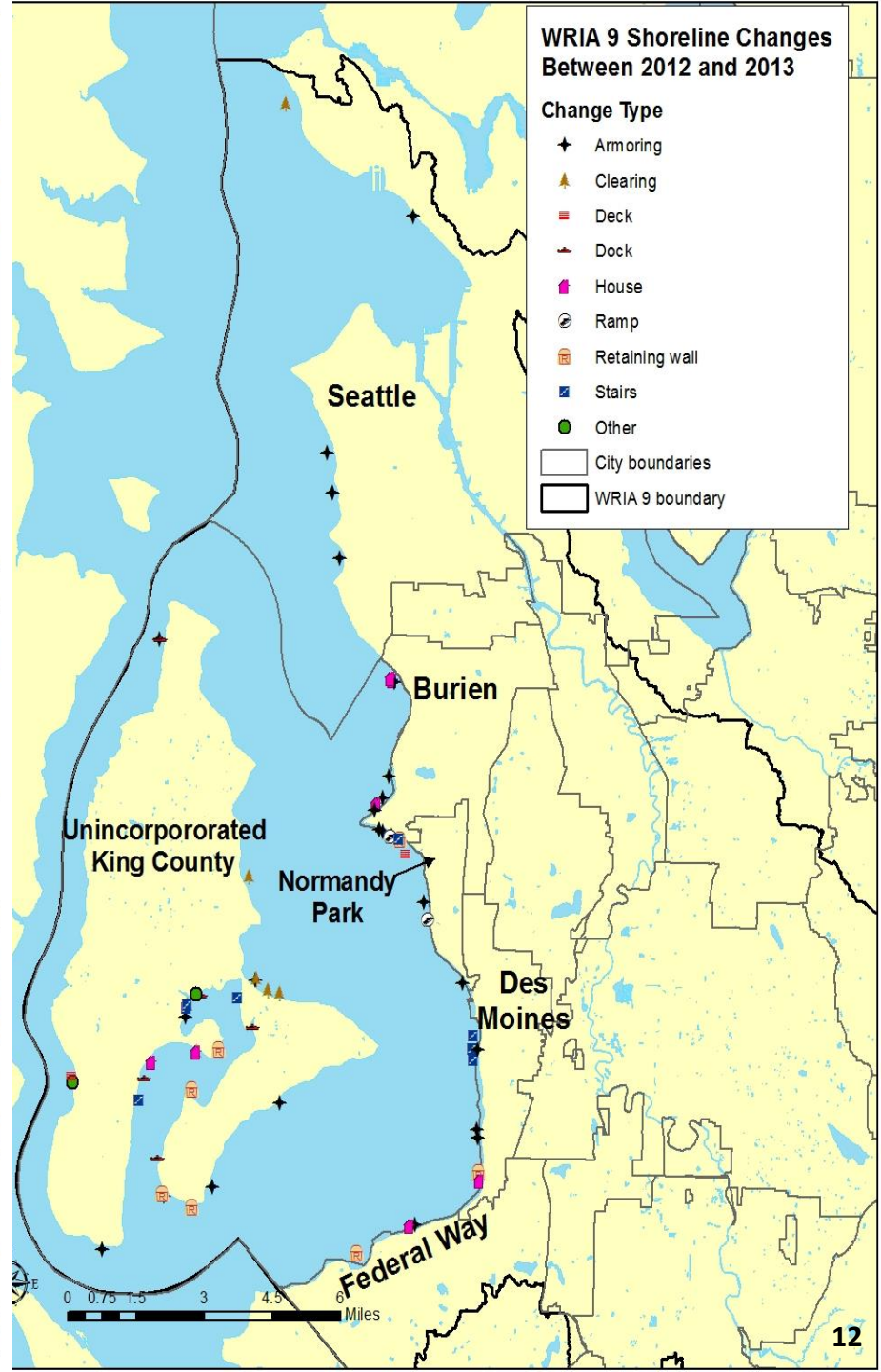
- + Armoring
- ▲ Clearing
- Dock
- ▲ Groins
- ◇ Derlict barge
- Aquaculture
- House
- Ramp
- Stairs
- WRIA 9 boundary
- City Boundaries



WRIA 9 Shoreline Changes Between 2012 and 2013

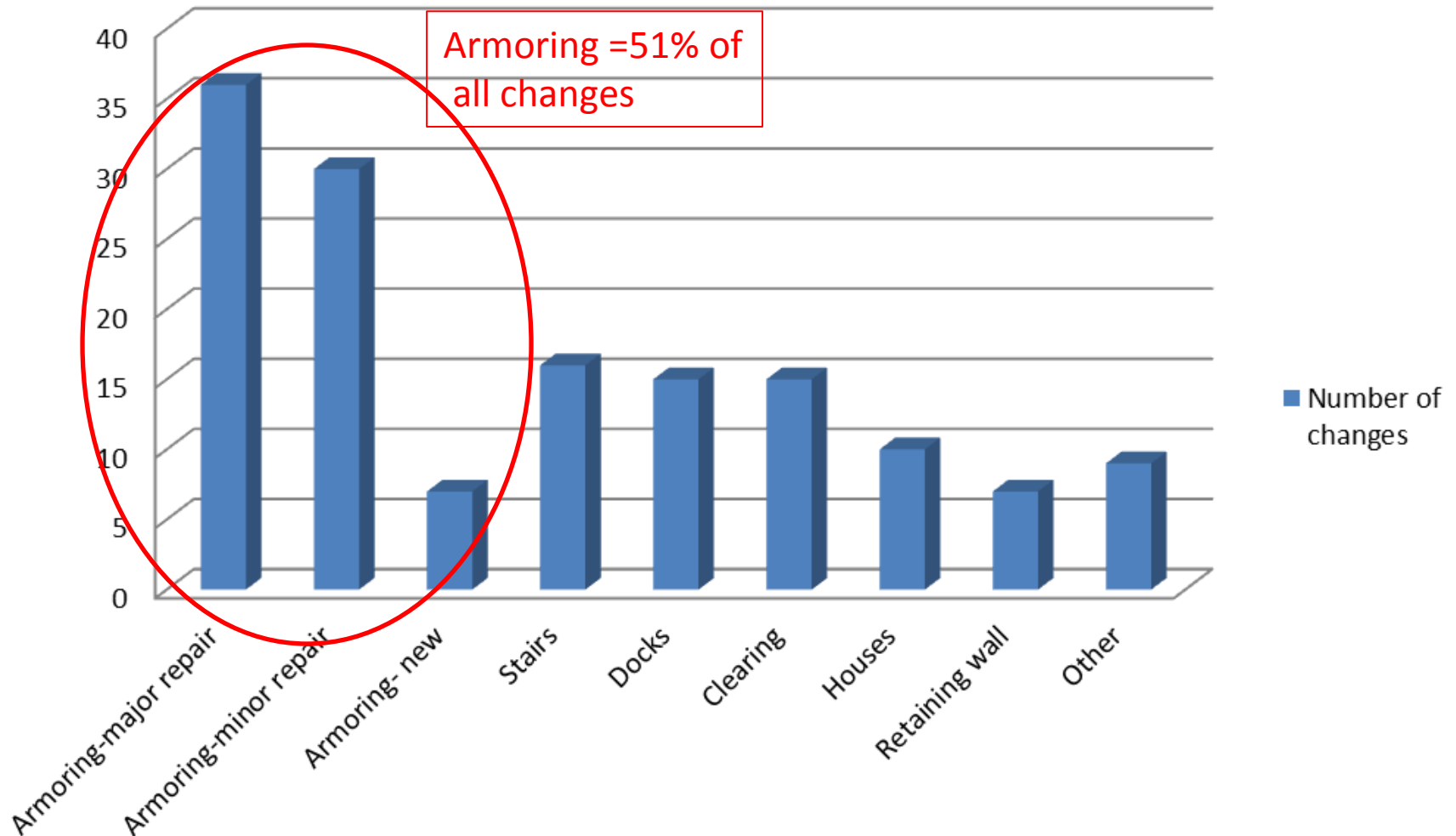
Change Type

- + Armoring
- ▲ Clearing
- Deck
- Dock
- House
- Ramp
- Retaining wall
- Stairs
- Other
- City boundaries
- WRIA 9 boundary



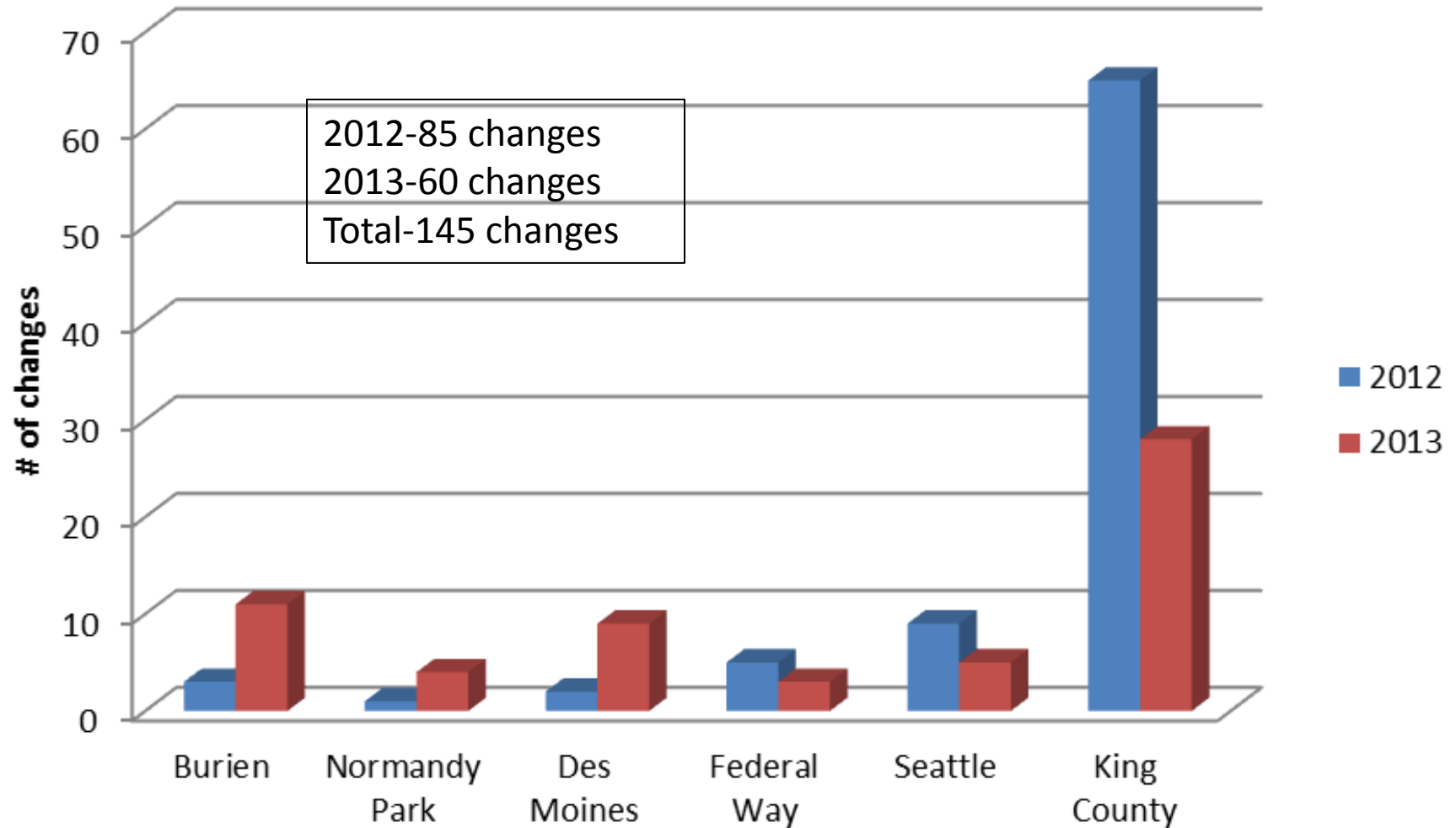
What type of changes were seen?

Number of different shoreline changes



Where were they seen?

Number of & where changes occurred



The 2012 survey looked at changes between 2004 and September of 2012 (~8 years)

The 2013 survey looked at changes between Sept 2012 and June of 2013 (less than a year)

2012-85 changes

2013-60 changes

Why so many changes in both surveys?

2013 survey

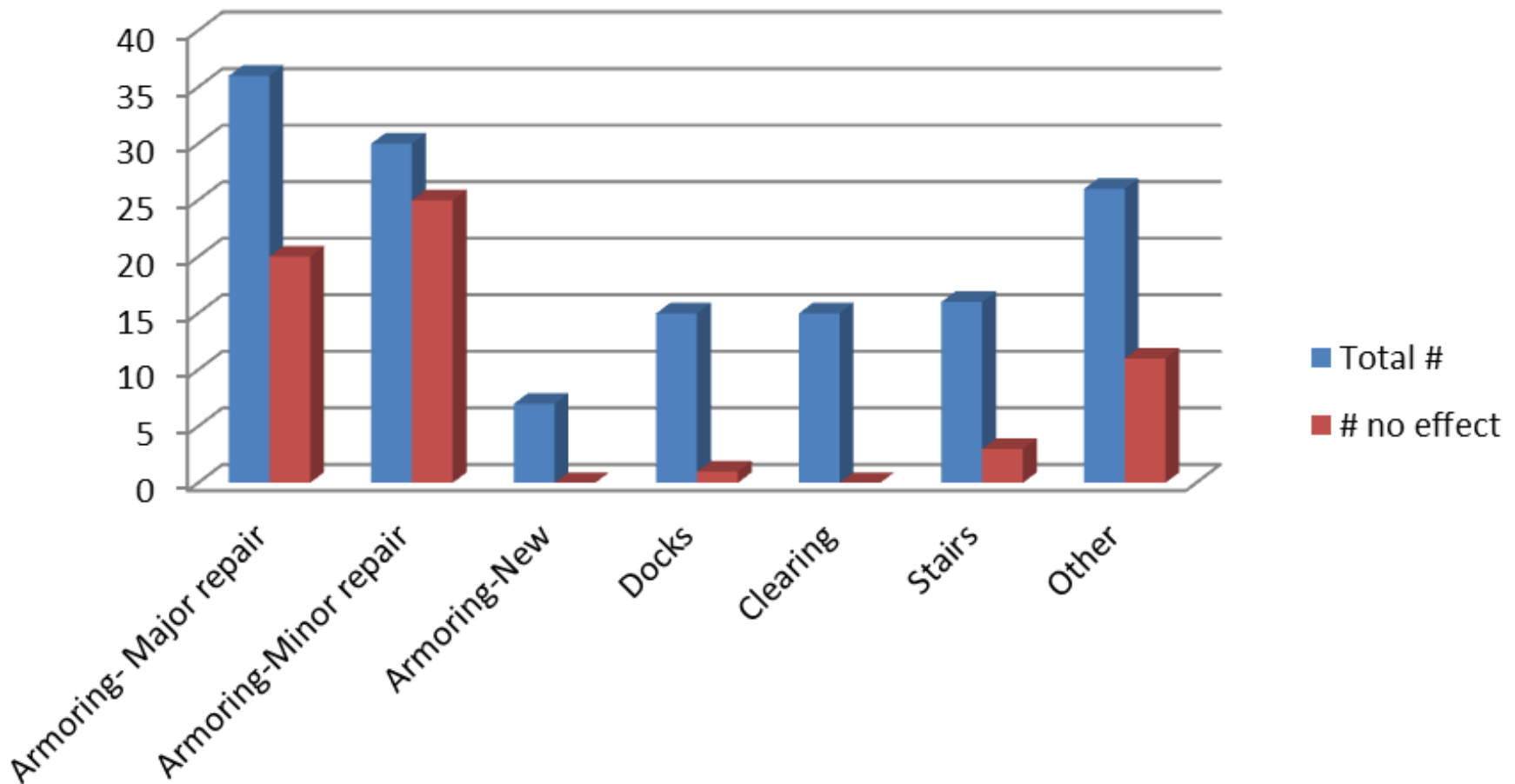
- ~10% were older, missed in the 2012 survey
- Highest tide on record between surveys
- Very wet fall/winter
- Changes easier to pick out due to newness

Evaluated impacts to ecological & physical processes

- Sediment delivery to beach
- Sediment transport along the beach
- Light energy (day & night)
- Organic material accumulation (input & storage)
- Wave energy
- Water Quality
- Forage fish spawning habitat displacement
- Hazards to public safety

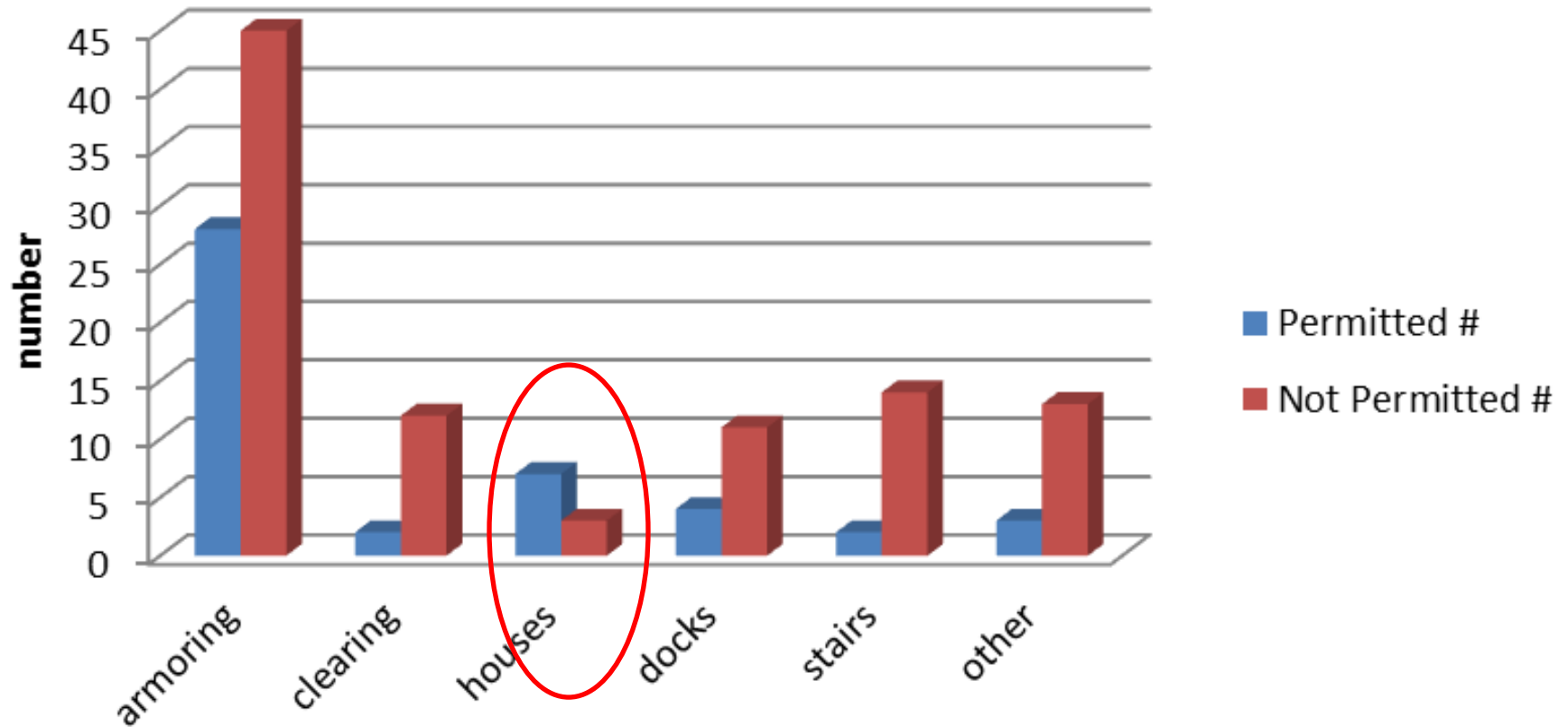
How many and what type had no apparent effect?

of changes with no apparent effect



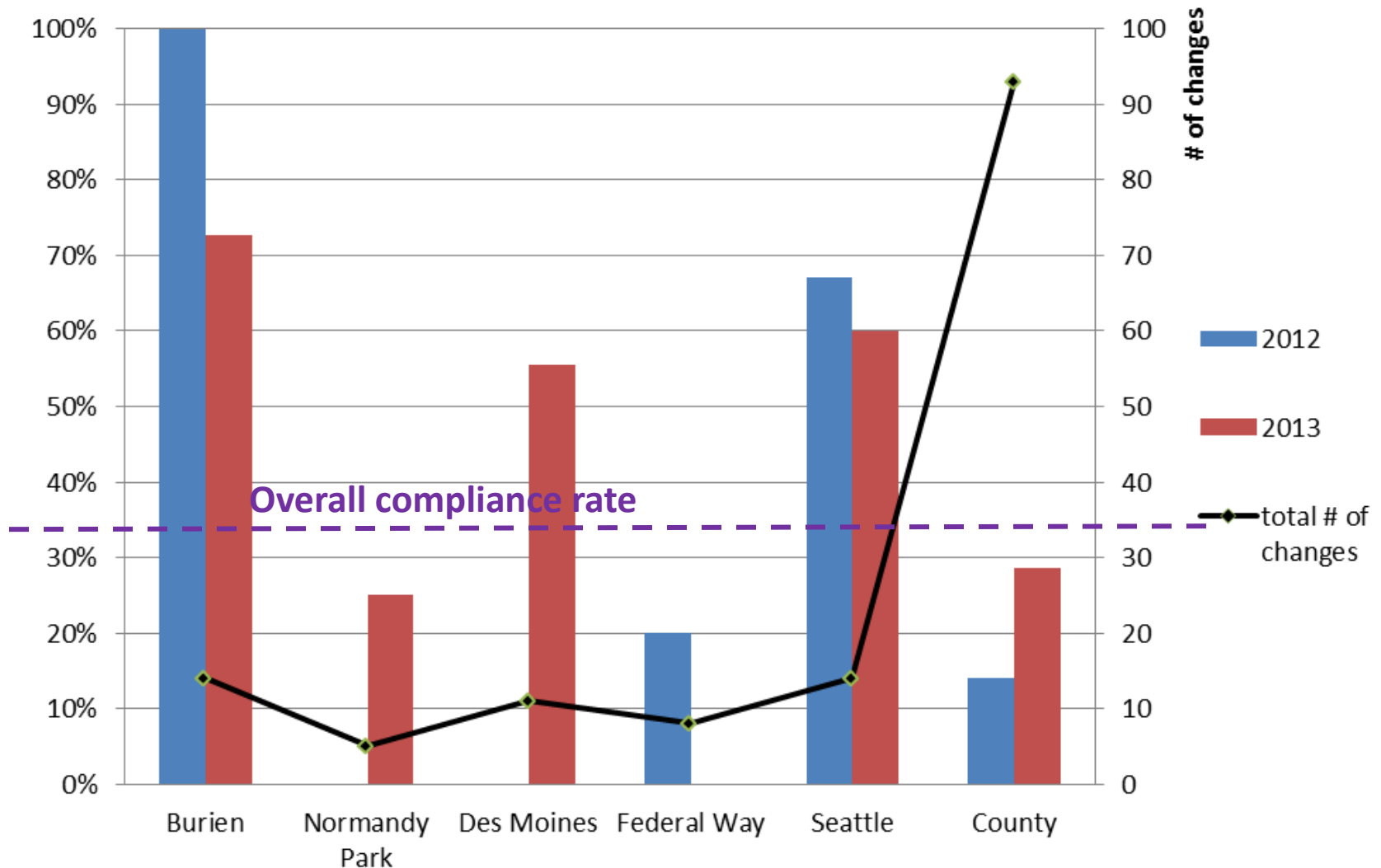
Evaluated if changes in condition had a City or County permit for the change

Compliance by type of change



Evaluated if changes in condition had a local permit, *continued*

Compliance by jurisdiction



Enforcement

- Original intent was to track enforcement outcomes of unpermitted changes
- Time constraints did not allow a thorough evaluation of enforcement activities
- Of the 96 total unpermitted changes in shoreline condition, eight of them were already in enforcement process when they were encountered during the surveys



Take Aways

- **Between 2005 and June 2013**
 - ~1500 feet of shoreline armoring was removed via restoration projects**
 - ~1570 feet of new shoreline armoring was constructed**

The Puget Sound Partnership has a goal of a net decrease in shoreline armoring from 2011-2020 across Puget Sound

- In 2005-2010 permitted projects resulted in:
 - Net gain of 6 miles of new armoring
 - 14.5 miles of repair/replacement
- Assuming compliance rates similar to WRIA 9:
 - 60% for new armor—net gain actually = 8.5 miles
 - 40%* for repairs—repairs would be around 23 miles

* 40% is the approximate average compliance between minor and major repairs

Take Aways



Between 2005 and June of 2013

- Even with Critical Area Ordinances (CAO) that protect marine riparian areas, more trees and shrubs are being cleared than are being replanted/restored or naturally re-establishing

Take Aways

- Most of the changes involved repairs to existing infrastructure



- Did not attempt to answer why people are or aren't getting permits

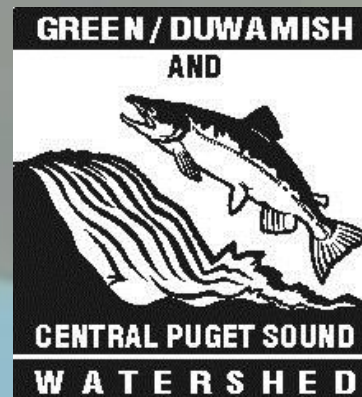
Lower compliance rate compared to other areas of Puget Sound

- Bainbridge (80%)
&
- San Juan (50%)



09.10.2012

- To get entire report—google “WRIA 9 monitoring compliance”
- Thanks to the Puget Sound Marine and Nearshore Protection and Restoration Grant Program for selecting this project for funding
- Thanks to EPA and WRIA 9 for project funding and support



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